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SELF- AND CROSS-POLLINATION OF WESTERN WHITE PINE: A COMPARISON OF HEIGHT GROWTH OF PROGENY

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ABSTRACT

Height growth of 9- to 12-year-old western white pine seedlings from self-pollinated parents was compared with that of seedlings from cross-pollinated parents. Data indicate that growth depression from selfing, previously observed in the nursery, continues undiminished after inbred seedlings are outplanted.

Western white pine seedlings resulting from self-pollination are typically slower growing than seedlings from cross-pollination. Combined data from Squillace and Bingham (1958)² and Barnes et al. (1962),³ indicate the magnitude of this growth depression (measured by epicotyl length adjusted for seed weight) is about 28 percent (table 1). The selfed offspring from completely self-fertile trees show less growth depression (15 percent) than selfed offspring from partially self-fertile trees (40 percent).

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² Squillace, A. E., and R. T. Bingham. Selection fertilization in Pinus monticola Dougl. I. Preliminary results. *Silvae Genetica* 7: 188-196, illus. 1958.

³ Barnes, Burton V., R. T. Bingham, and A. E. Squillace. Selective fertilization in Pinus monticola Dougl. II. Results of additional tests. *Silvae Genetica* 11: 103-11, illus. 1962.

Table 1.--Comparison of height growth of 1-year-old western white pine seedlings:
progeny from self-pollination compared with progeny from cross-pollination

Mating (tree number)	Length of epicotyl ¹	Growth of self compared to growth of outcross
	<u>mm.</u>	<u>Percent</u>
<u>Progeny of completely self-fertile trees</u>		
58 X 58	22.0	
58 X 18	² 32.0	-31
58 X 58	17.3	
58 X 18	24.6	-30
58 X 58	22.0	
58 X 19	21.0	+5
69 X 69	14.9	
69 X 64	15.2	-2
69 X mm ³	17.8	-16
<u>Progeny of partially self-fertile trees</u>		
19 X 19	13.0	
19 X 58	21.0	-38
54 X 54	9.1	
54 X 69	14.8	-39
54 X mm	16.7	-46
64 X 64	11.7	
64 X 18	19.0	-38
64 X 58	17.7	-34
64 X mm	20.1	-42

¹ Epicotyl length adjusted for seed weight.

² Discrepancy noted in the published 1958 value and changed here according to the 1962 findings.

³ Mm (multiple mix) was a mixture of an equal volume of pollen from eight trees.

The field performance of 9- to 12-year-old seedlings resulting from self-pollination was compared with that of seedlings from cross-pollinations at three sites in northern Idaho (table 2). The seedlings compared have the same female parent. Parent trees were similar in class; some grew on low-elevation sites (3,000 feet) and others on high-elevation sites (4,800 feet).

These comparisons indicate that growth depression observed in the nursery continued undiminished after the inbred seedlings were outplanted. Selfed progeny from high-elevation female parents showed greater growth depression than progeny from low-elevation female parents. Growth depression of low-elevation selfs and high-elevation selfs was greater at site 1 than at other sites.

At all three sites, survival of progeny from self-pollination was less than that of progeny from cross-pollination (site 1: 58 percent versus 78 percent; site 2: 45 percent versus 58 percent; site 3: 61 percent versus 77 percent).

These observations indicate the importance of using seed collection techniques and nursery practices that decrease the possibility of planting inbred seedlings. Seed should be collected from trees within stands, not from isolated individuals. Seed should not be collected from trees along roads, streams, and meadows where large-crowned, isolated trees are often found. In the nursery, seedlings should be culled on the basis of slow height growth as well as poor root development. Such practices should measurably improve the quality of nursery stock.

Table 2.--Comparison of height growth of 9- to 12-year-old western white pine seedlings: selfs compared with crosses

Site ¹	Female parent--low elevation				Female parent--high elevation			
	Seedlings		Height growth	Seedlings	Height growth			
	Lots	Self	Outcross	depression of selfed progeny	Lots	Self	Outcross	depression of selfed progeny
	- - - Number - - -		Percent		- - - Number - - -		Percent	
1	5	37	149	30	4	16	175	43
2	5	25	111	22	2	7	61	36
3	21	88	807	27	5	24	165	28

¹ Site 1--elevation 3,650 feet, Snyder Creek Drainage, Deception Creek Experimental Forest, Coeur d'Alene National Forest, Kootenai County, Idaho.

Site 2--elevation 2,500 feet, Benton Creek Drainage, Priest River Experimental Forest, Kaniksu National Forest, Bonner County, Idaho.

Site 3--elevation 2,650 feet, Forestry Sciences Laboratory, Blister Rust Resistant White Pine Arboretum, Moscow, Latah County, Idaho.

